

REMARKS

This responds to the Office Action mailed on October 9, 2007.

No claims are amended, canceled, or are added; as a result, claims 7-11 and 17-25 remain pending in this application.

Allowable Subject Matter

Applicant's appreciate the Examiner's determination, by allowing claims 22-25, that this application contains patentable subject matter.

§103 Rejection of the Claims

Claims 7-11 and 17-21 were again rejected under 35 U.S.C. § 103(a) as being unpatentable over Dangelo et al. (U.S. 7,109,581) in view of Uang et al. (U.S. 6,989,325) and Brown et al. (U.S. 6,340,822). Applicants respectfully traverse the rejection as failing to make out a *prima facie* showing of obviousness for the reasons stated below.

Discussion of Independent Claim 7:

Claim 7 recites as follows (with emphasis added):

7. An integrated circuit package, comprising
a die;
a heat sink, wherein **both an upper surface of the die and a lower surface of the heat sink have metal coatings of gold**; and
a first thermal intermediate portion comprising a plurality of carbon nanotubes, some nanotubes of which have organic moieties attached to one end thereof, the one end of some nanotubes chemically bonded to the heat sink; and
a second thermal intermediate portion comprising a plurality of carbon nanotubes, some nanotubes of which have organic moieties attached to one end thereof, the one end of some nanotubes chemically bonded to the die.
(Emphasis added)

Applicants respectfully submit that, even in combination, Dangelo, Uang and Brown do not teach or suggest each and every element of the rejected independent claims 7 and 17 for the reasons stated below.

Applicants submit that Dangelo teaches away from a feature “both an upper surface of the die and a lower surface of the heat sink have metal coatings of gold” as recited in claims 7

and 17. Dangelo neither shows nor suggests using a gold coating— at most, it suggests the use of eutectic metal bonding¹ and use of a *metal catalyst* layer selected from a closed group of catalytic materials that does not include gold²:

In the "Response to Arguments" section of the Office Action, the Office Action challenged Applicant's assertion, made in the Appeal Brief, that "Dangelo teaches away from using gold as coating material on the heat sink," stating that:

"Dangelo merely discloses that "Metal catalyst layer 410 may be chosen from among Ti, Co, Cr, Pt, Ni and their alloys. Preferably, metal catalyst layer 410 are Ni and Ni alloys³"

and contending that the quoted disclosure "does not assert the Applicant's (teaching away) argument."

Applicants respectfully traverse the Examiner's conclusion that Dangelo does not teach away from using gold as the catalyst material 410. The Examiner's conclusion is erroneous for several reasons. First, the quoted passage from Dangelo recites the a list of choices for the catalyst material in *closed form* with an added specification that Ni and Ni alloys are preferred. Gold was not included in that list. Furthermore, the Examiner has not shown that gold could properly be a part of the list of metals for a catalyst layer 410 which meets the specific requirements of Dangelo for the catalyst layer 410. For example, Dangelo imposes a restriction that "Metal catalyst layer 410 is used to initiate and control growth of the nanotubes in layer 408⁴." A further condition placed on layer 410 by Dangelo is that the adhesion of catalyst metal layer 410 is aided by layer 412⁵, a layer described in Dangelo as "composed of silicon nitride

¹ Dangelo, col. 5, ln. 46-52:

"An additional (optional) bonding layer 406 can be added, if **eutectic metal bonding** between chip 402 and layer 408 is desired. In this case, the exposed nanotube ends would protrude into this layer and may extend through it. Preferably, **bonding layer 406 is a eutectic metal**, but thermal polymer based bonding compounds may also be used."
(Emphasis added)

² Referring to col. 5, ln. 58-62 of Dangelo,

"Metal catalyst layer 410 is used to initiate and control growth of the nanotubes in layer 408. **Metal catalyst layer 410 may chosen from among Ti, Co, Cr, Pt, Ni and their alloys. Preferably, metal catalyst layer 410 are Ni and Ni alloys.**"
(Emphasis added)

³ Office Action of October 9, 2007, page 4, lines 5-7 quoting from Dangelo col 5 lines 58-61.

⁴ Dangelo, col 5, lines 57-58.

⁵ See Dangelo, col 5, lines 55-57.

compounds⁶." Applicants suggest that since a prima facie showing of obvious has not been shown, it is not their burden to show gold cannot be used in catalyst layer 410 of Dangelo to prove that Dangelo teaches away from including gold in the material for layer 410, but rather it remains the Examiner's burden to show that the list of catalyst materials 410 could include gold and still meet the restrictions imposed by Dangelo that its adhesion would be aided by the silicon nitride compounds of layer 412 and that gold would serve as a catalyst to initiate and control growth of the nanotubes in layer 408. To date, the Examiner has not attempted to introduce such a showing, either during the prior appeal or in the present Office Action.

While the Office Action concedes that Dangelo fails to show a coating of gold on both of the die and the heat sink as recited in claim 7, it asserts that Uang discloses coating both the die and the heat sink and argues it would be obvious to one of ordinary skill in the art to incorporate such teachings of Uang into Dangelo. Applicants disagree with the conclusory assertion because, as shown above, Dangelo teaches away from using gold as coating material on the heat sink and the die.

For at least these reasons, Appellant respectfully submits that the §103 rejection of independent claim 7 and its dependent claims 8-11 and 17-21 is improper and should be reconsidered and withdrawn.

Reservation of Rights

In the interest of clarity and brevity, Applicant may not have equally addressed every assertion made in the Office Action, however, this does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official

⁶ Dangelo col 5, lines 54-55.

Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (612) 373-6970 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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Date

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the USPTO's electronic filing system EFS-Web, and is addressed to: Mail Stop Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 9th day of January 2008.

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